Development of a Gamma-Ray Scattering Polarimetry Detector for CubeSats

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Instrument Operation Principles

The instrument uses a Compton scattering polarimetry architecture which uses a central scattering rod and records the scattering distribution in the azimuthal plane of the detector.

Performance Simulation

Simulations are run using GEANT4 with a basic scatter rod of plastic scintillator surrounded by Cesium Iodide scintillator. The simulation results are used as the photon detection efficiency of our detector. We consider the depth of the scattering rod and absorber thickness against the percentage of scatter events.

The minimum detectable polarization is measure of observation time to detect with 99% probability a certain polarization percentage. This measures detector performance for targets in a given timeframe.

Conclusions

The Compton scattering instrument will be sensitive to a wide range of energies from hard X-ray into the gamma ray. Our mission will be to survey targets and gather polarization percentage and angle measurements of the bright X-ray and gamma ray catalogs. Astrophysics measurements are possible in a CubeSat volume, small missions like these have great possibility for swarms and technology demonstrations for larger future instruments. We will propose to CSLU and ROSES solicitations this year for an intended flight around 2020.

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